



Patterned Pavement

S523

Review and Lessons Learned

Presenter:



Paul Gentry – Product Evaluation
Coordinator
Program Management

Objectives

- S523 Review
- Current APL Products
- Skid Testing Overview
- The Products in Use
 - Wear and Tear
 - Failures
- MMOA Details
- Green Bike Lanes materials update
- Emphasis Markings (these are also in crosswalks)

SECTION 523 PATTERNED PAVEMENT

523-1 Description.

Install patterned pavement on asphalt or concrete pavement areas at locations and with the color and pattern as specified in the Plans. Use products listed on the Approved Product List (APL), as approved for use in areas subject to vehicular traffic or non-vehicular traffic, respectively, as specified herein. Install products in accordance with manufacturer's recommendations.

For the purpose of this Specification, patterned pavements are defined as a post applied surface marking overlay to either the pavement surface or to an imprinted pavement surface. Vehicular traffic areas are defined as those subject to vehicles within the traveled way, shoulders and auxiliary lanes. Non-vehicular travel areas include medians, islands, curb extensions, sidewalks, borders, plazas and other areas typically subject to foot traffic only.

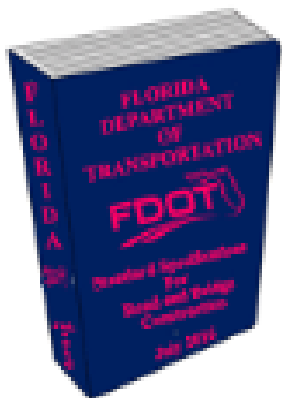
Install overlay products in areas subject to vehicular traffic to a thickness not exceeding 180 mils. Do not use products requiring removal of pavement or requiring blockouts or trenches below the top of pavement.

Variations within a pattern shall comply with ADA requirements.

Two different APL categories:

Vehicular - subject to vehicular traffic "in the traveled way"

Non-Vehicular – subject to "off the traveled way", medians, crosswalks, plazas, etc.



523-2 Materials.

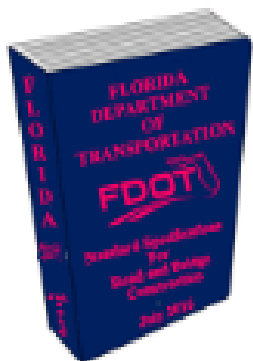
523-2.1 General: Use only patterned pavement products approved for use in vehicular and non-vehicular areas, as appropriate, and listed on the APL. Meet manufacturer's specifications for all patterns, textures, templates, sealers, coatings and coloring materials.

Material coatings used to achieve the pattern and color shall produce an adherent, weather resistant, skid resistant, wear resistant surface under service conditions. Color shall be integral and consistent throughout the installation. The composition of materials is intended to be left to the discretion of the manufacturer.

Materials shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA), Subpart C, Table 1 of 40 CFR 261.24 "Toxicity Characteristic". Materials shall not exude fumes which are hazardous, toxic or detrimental to persons or property.

523-2.2 Approved Product List (APL): Manufacturers seeking evaluation of their product shall submit an application in accordance with Section 6 along with the following documentation:

1. Manufacturer's recommendations for applicability of use on concrete or asphalt surfaces.
2. Manufacturer's recommendation for applicability of use in vehicular or non-vehicular travel areas.
3. Manufacturer's specifications and procedures for materials and installation for each use above.



4. For products proposed for use in vehicular traffic areas, independent test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with either:

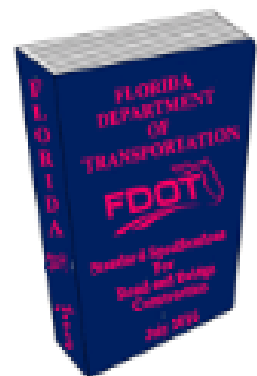
a. ASTM E-274, Skid Resistance of Paved Surfaces using a standard ribbed full scale tire at a speed of 40 mph (FN40R), and has a minimum FN40R value of 35, or

b. ASTM E-1911, Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester (DFT), at a speed of 40 mph (DFT40), and has a minimum DFT40 value of 40.

5. For products proposed for use in non-vehicular traffic areas, independent test data verifying the material meets the requirements of this Section including verification that the product, installed in accordance with the manufacturer's specifications and procedures, has been tested in accordance with ASTM E-303 using the British Pendulum Tester and has a British Pendulum Number (BPN) of at least 40.

6. For products proposed for use as a bike lane application, independent testing verifying that the material can meet the color as identified in the April 15, 2011, Interim Approval for Optional use of Green Colored Pavement for Bike Lanes, Interim Approval (IA-14) Memorandum Valid Under the 2009 MUTCD

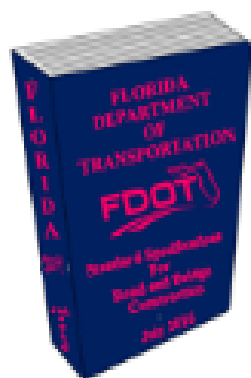
(http://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/index.htm).



523-2.3 Performance Requirements for Products in Vehicular Travel Areas: In addition to the submittal requirements of 523-2.2, APL approval will be contingent on a field service test demonstrating that the patterned pavement product meets the following performance measures at the end of three years from opening to traffic:

1. The average thickness shall be a minimum of 50% of the original thickness.
2. Wearing of the material coating shall not expose more than 15% of the underlying surface area as measured within the traveled way.
3. Friction performance of patterned/textured pavement materials shall meet or exceed one of the following test method values:
 - a. FN40R value of 35 in accordance with ASTM E-274; or,
 - b. DFT40 value of 40 in accordance with ASTM E-1911

Manufacturers shall provide a field service test installation of each product within a marked crosswalk on a roadway with an ADT of 6,000 to 12,000 vehicles per day per lane, on a site approved by the Department. The test installation shall be a minimum six feet wide and extend from pavement edge to pavement edge across all traffic lanes and shoulder pavement at the crosswalk location. The test installation shall be tested by the manufacturer in accordance with FM 5-592.



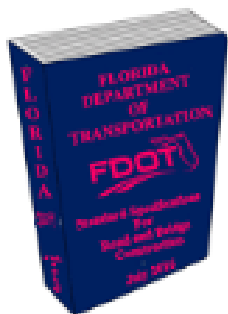
523-3 Construction.

523-3.1 Product Submittals: Prior to installation, submit pattern and color samples to the Engineer for confirmation that the product meets the pattern and color specified in the Plans. Do not begin installation until acceptance by the Engineer.

523-3.2 Pavement Cuts: Complete all utility, traffic loop detector, and other items requiring a cut and installation under the finished surface, prior to product installation.

523-3.2 Surface Protection: Protect treated surfaces from traffic and environmental effects until the product is completely installed, including drying and curing according to the manufacturer's instructions.

523-3.3 Installation Acceptance: For installation on new asphalt roadways, apply patterned pavement a minimum of 14 days after placement of the adjacent pavement.



Upon completion of the installation, the Engineer will check the area at random locations for geometric accuracy. If any of the chosen areas are found to be deficient, correct the entire patterned area at no additional cost to the Department.

Submit certification that the patterned pavement was installed in accordance with the manufacturer's requirements.

523-4 Method of Measurement.

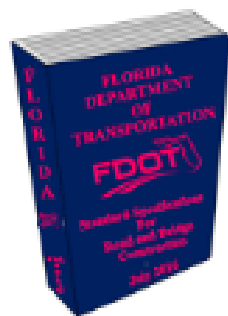
The quantity to be paid will be the plan quantity in square yards of patterned pavement, completed and accepted. No deduction will be made for areas occupied by landscaping, manholes, inlets, drainage structures, or by any public utility appurtenances within the area.

523-5 Basis of Payment.

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

- | | |
|------------------|---|
| Item No. 523- 1- | Patterned Pavement (Vehicular Areas) - per square yard. |
| Item No. 523- 2- | Patterned Pavement (Non-Vehicular Areas) - per square yard. |



Approved Product List

Product Type - Patterned Pavement

Specifications / 523: Patterned Pavement / 000: Patterned Pavement

SortProduct Name Ascending

11 Product Results

<div>CityBrick</div> <div>Supplier: Atlantic Paving Co., Inc.</div> <div><ul style="list-style-type: none">Model Number:APL Certification Number: 523-000-017Comment: Approved for Non-Vehicular use only</div>
<div>Duratherm</div> <div>Supplier: Flint Trading Inc</div> <div><ul style="list-style-type: none">Model Number:APL Certification Number: 523-000-007Comment: Approved for Vehicular and Non-Vehicular applications</div>
<div>FrictionPave Decorative Surfacing</div> <div>Supplier: Pattern Paving Products</div> <div><ul style="list-style-type: none">Model Number:APL Certification Number: 523-000-005Comment: Approved for Vehicular and Non-Vehicular applications</div>
<div>Liquid Brick ECO</div> <div>Supplier: Atlantic Paving Co., Inc.</div> <div><ul style="list-style-type: none">Model Number:APL Certification Number: 523-000-019Comment: Approved for Vehicular and Non-Vehicular applications. Approved for bike lane use.</div>
<div>LiquidBrick-HF</div> <div>Supplier: Atlantic Paving Co., Inc.</div> <div><ul style="list-style-type: none">Model Number:APL Certification Number: 523-000-021Limitation: Conditional ApprovalComment: Approved for Vehicular and Non-Vehicular applications</div>

Paveway STS



Figure 1. Paveway STS field friction test section.



FrictionPave



Figure 1. FrictionPave field friction test section.



Duratherm



Figure 1. Duratherm's photographs for SR 222 located near 39th Ave and NW 51st Street.



TrafficPatterns

Q.P.L.# S523-0009



Preformed thermoplastic product with antiskid materials imbedded into the material heated onto the roadway surface





Flint Trading TrafficPatterns
Installation



TrafficPrint EX



Cold applied epoxy based decorative surfacing system that incorporates Hard wearing granite aggregate for long term durability

Liquid Brick eco



Colored surface treatment for highways consists of a epoxy applied to a sound substrate and covered with natural colored aggregate

CityBrick *** non-vehicular applications only!



“Epoxy modified Traffic Coating” is a high quality water-borne acrylic finish incorporating an epoxy additive to increase the abrasion resistance of the film.



Traffic Calming TrafficPrint F Installation

*** product no longer on the APL

****Note: “Mill and Fill” no longer
allowed as of 1/12 workbook





Thermal Heater used to melt Preformed Thermoplastic



Skid Resistance

- Testing Methods
 - Full-scale Tire (Truck and Trailer)
 - Dynamic Friction Tester (DFT)

ASTM E 274

- ◆ Standard test method for skid resistance of paved surfaces using a full-scale tire (ASTM)
- ◆ Represents friction force on a locked test wheel as it is dragged over a wetted pavement surface under constant load and speed



Friction Number

- ◆ $FN = (F/W) \times 100$
- ◆ F = HORIZONTAL FORCE
- ◆ W = DYNAMIC VERTICAL LOAD
- ◆ Ex. $[(500\text{lb}/1085\text{lb}) \times 100] = [46 \text{ FN}]$



TEST TRAILER OPERATION

The test trailer operations:

- ◆ 40 mph
- ◆ Wet Test
- ◆ Test designated lane
- ◆ 3 second lockup/ 180 ft

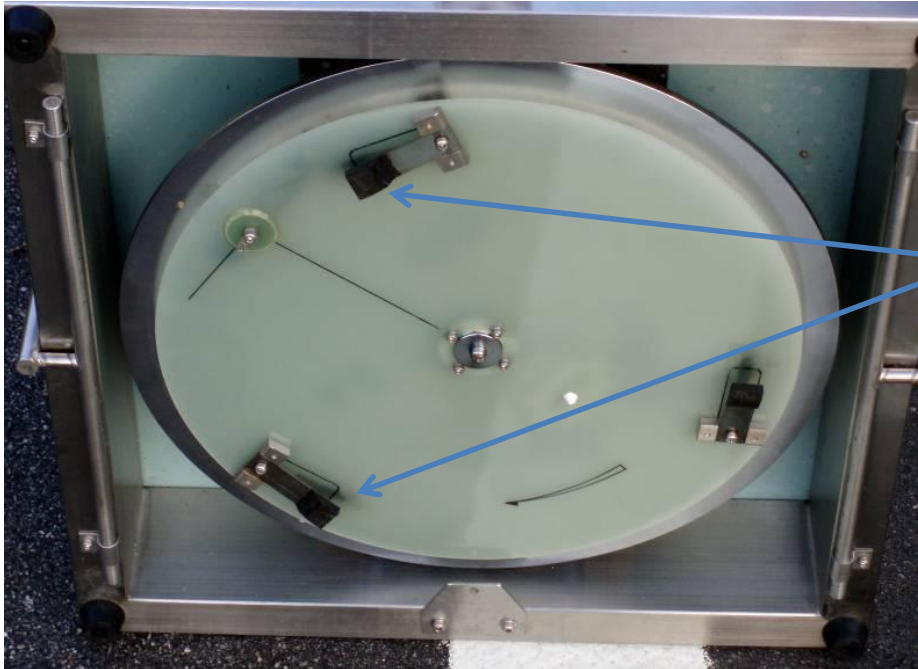


Lock Wheel Tester, in accordance with ASTM E 274, is a "Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire (FN40R)"



Dynamic Friction Tester (DFT)

- Portable device for obtaining friction measurements of flat surfaces as standardized
- ASTM E 1911, Standard Test Method for Measuring Paved Surface Frictional Properties using the Dynamic Friction Tester

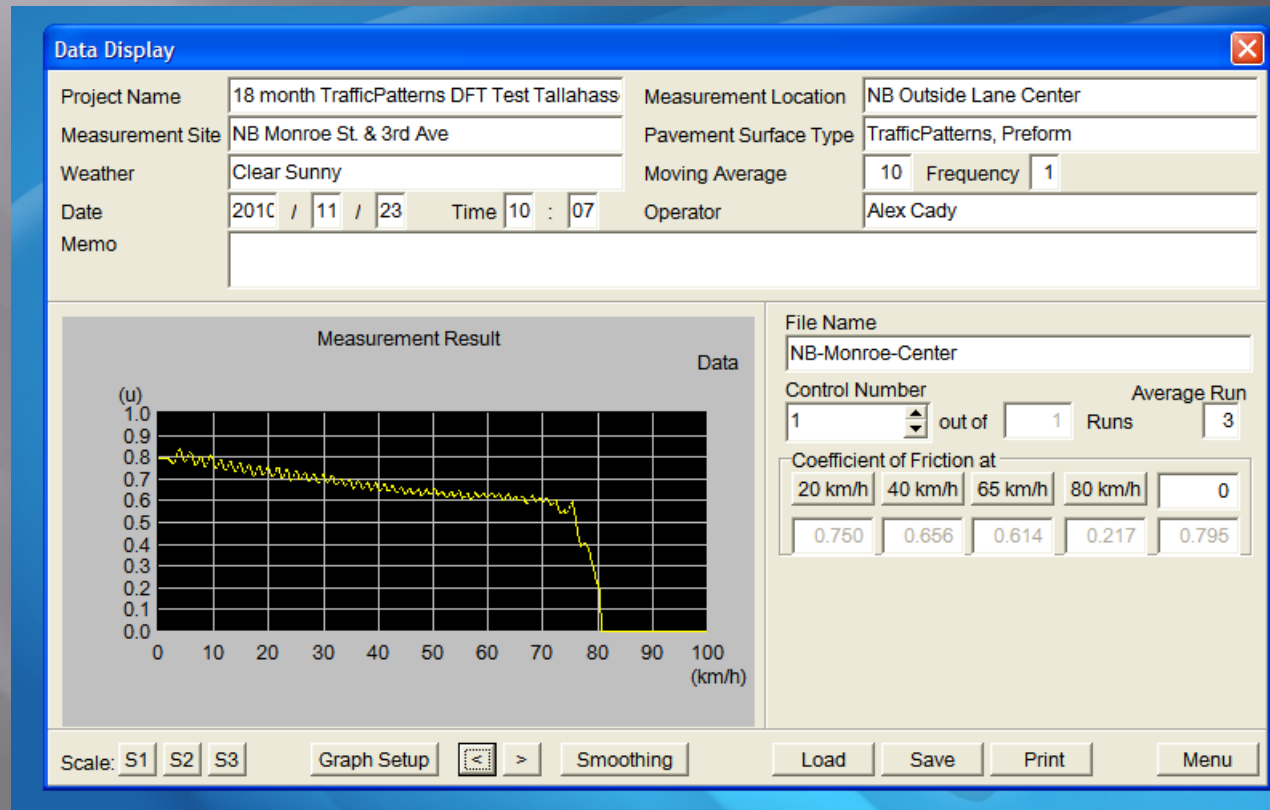


Rubber sliders under the
Dynamic Friction Tester (DFT)

Dynamic Friction Testing (DFT) in Use



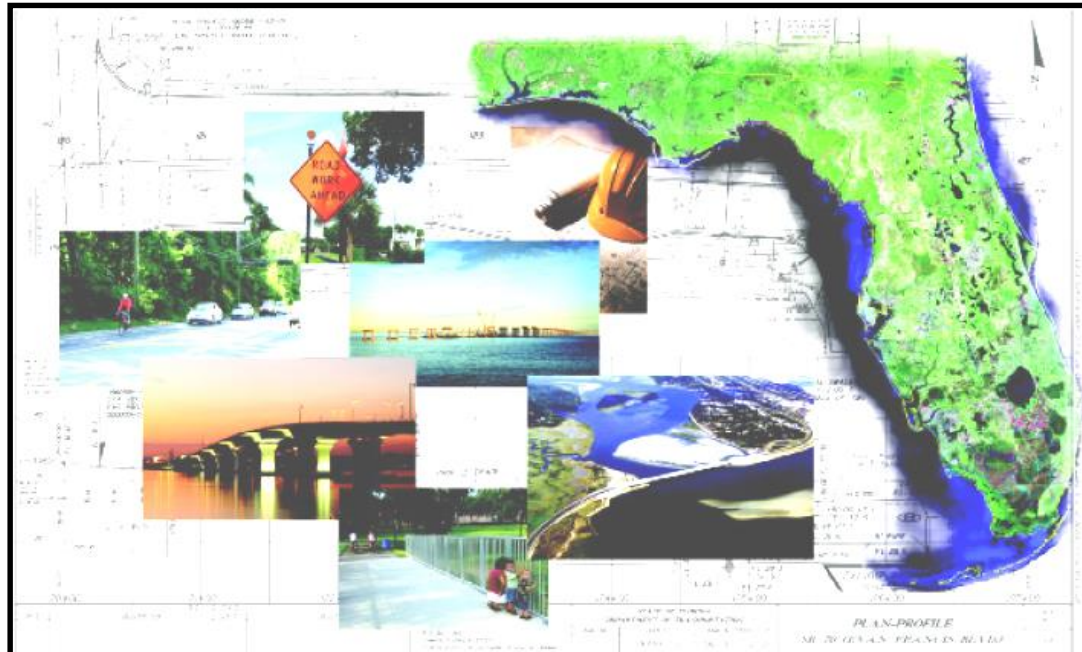
DFT (Dynamic Friction Tester) Data Display chart



Plans Preparation Manual

Provides Guidance and Requirements

- Where and when to allow
- MMOA (Maintenance Memorandum of Agreement)





Roadway Design

Roadway Design / Roadway Criteria / Plans Preparation Manual / 2016

2016



These .PDF files are formatted for two-sided printing (front/back) pre-punched three-hole paper is available through office supply store. These documents can only be viewed with [Adobe Acrobat Reader](#). All files are less than 1mb in size unless noted otherwise.

Volume 1

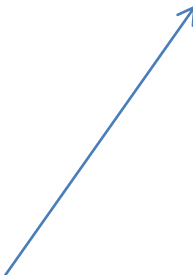
Complete PDF Files	Title
Volume 1 Complete	Complete Volume 1 - (14mb file size)
Volume 1 Cover	Color Binder Cover and Color Spine
Cover Sheet	Inside Cover
Registration Form	Registration Form
Suggestions	Suggestions
Table of Contents	Volume 1 Table of Contents
Introduction	Introduction
Chapter 1	Design Controls
Chapter 2	Design Geometrics and Criteria - (2.2Mb file size)
Chapter 3	Earthwork
Chapter 4	Roadside Safety
Chapter 5	Utilities
Chapter 6	Railroad Crossing
Chapter 7	Traffic and ITS Design
Chapter 8	Pedestrian, Bicycle and Public Transit Facilities
Chapter 9	Landscape and Community Features
Chapter 10	Transportation Management Plan
Chapter 11	Stormwater Pollution Prevention Plan
Chapter 12	Right of Way
Chapter 13	Initial Engineering Design Process

Guidance is contained with PPM, Volume
1, Chapter 2

Chapter 2

Design Geometrics and Criteria

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PPM Section 2.1.6.1

2.1.6.1 Alternative Roadway Paving Treatments

Alternative paving treatments, such as patterned pavement and architectural pavers meeting FDOT Specifications, may be used for enhancing aesthetics and appearance when requested by a local community, and when the conditions and restrictions provided in this section are met. Patterned pavement treatments are covered under **Section 523** of the **FDOT Specifications** and are surface markings applied either as an overlay to the pavement surface or imprinted in the pavement surface. Architectural pavers are covered under **Section 526** of the **FDOT Specifications** and consist of brick pavers or concrete pavers placed on specially prepared bedding material.

These alternative pavement treatments are purely aesthetic treatments and are not considered to be traffic control devices. Use of either of these treatments is highly restricted as stated below. Even when all conditions and restrictions are met, any decision to use these treatments should consider that there may be potential adverse impacts to the traveling public as well as potential long term maintenance problems. Architectural pavers have been found to create significant ride-ability problems even on low speed roadways. Therefore, architectural pavers are prohibited within the traveled way on the State Highway System. Properly installed patterned pavement treatments do not significantly affect ride-ability; however, their use is also restricted since they are not likely to sustain their friction and wear characteristics for the full life of typical roadway pavement.

These paving treatments involve additional construction and maintenance costs not associated with typical roadway pavement. Therefore, appropriate agreements with the local maintaining agency shall be obtained. The local maintaining agency shall provide the additional funding for construction and assume responsibility for regular inspection and maintenance of the pavement treatment. Maintenance agreements for installations within the traveled way on the State Highway System shall include the provisions outlined in **Section 2.1.6.2** for the duration of the installation.

The following restrictions apply:

Architectural Pavers:

1. Shall not be used on the traveled way of the State Highway System.
2. May be used on local side streets (with a design speed of 35 mph or less), nontraffic medians and islands, curb extensions, sidewalks, borders, and other areas not subject to vehicle traffic.
3. ADA requirements shall be met in areas subject to pedestrian traffic. See **PROWAG R301.5 and R301.7** and **ADAAG 302 and 303** for surface requirements.

Patterned Pavement:

1. Use on the traveled way of the State Highway System is restricted to areas within marked pedestrian crosswalks where the design speed is 45 mph or less; however, patterned pavement shall not be used on pedestrian crosswalks across limited access roadway ramps. Use on pedestrian crosswalks with heavy truck traffic turning movements ($\geq 10\%$ trucks) should be avoided.
2. The pavement to which the treatment is applied shall be of the same pavement type as, and continuous with, the adjoining pavement. For example, replacing flexible pavement with rigid patterned pavement within the limits of a crosswalk where the abutting pavement is to remain flexible pavement will likely result in pavement joint problems and adverse impacts to rideability. This type treatment is therefore not permitted. Replacing flexible pavement with rigid pavement for an entire intersection including crosswalks may be permitted with a Technical Special Provision submitted to the State Roadway Design Engineer for approval.
3. The initial treatment cannot be applied to any State Highway whose asphalt pavement surface is older than 5 years.
4. May be used in areas not subject to vehicle traffic such as median islands, curb extensions, sidewalks, and landscaping borders.
5. ADA requirements shall be met in areas subject to pedestrian traffic. See **PROWAG R301.5 and R301.7** and **ADAAG 302 and 303** for surface requirements.

When architectural pavers are used, the plans shall identify the location, type, pattern, shape and color. In addition, project specific details and requirements for edge restraints, bedding material thickness, and base and subbase materials and thicknesses, as appropriate, must be developed and included in the plans, which shall be signed and sealed by a licensed Florida Professional Engineer.

When patterned pavement treatments are used, the plans shall identify the location, patterned type (brick, stone, etc.), and surface color. Because local agencies must fund and maintain these treatments, product brands, colors and patterns may be specified in the plans as long as the brand is listed on the QPL at the time of use. Design Variations to any of the requirements in this Section shall be approved by the District Design Engineer.

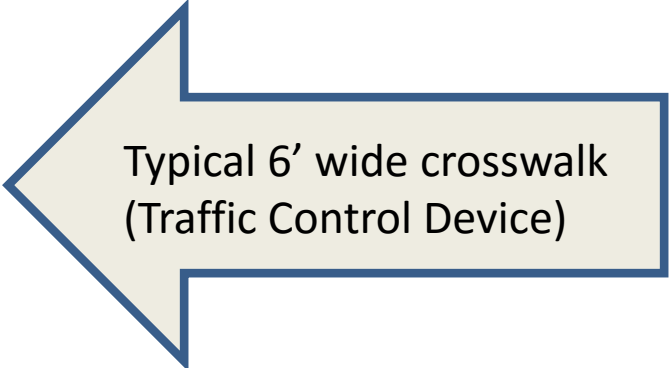
2.1.6.1 Alternative Roadway Paving Treatments

Alternative paving treatments, such as patterned pavement and architectural pavers meeting *FDOT Specifications*, may be used for enhancing aesthetics and appearance when requested by a local community, and when the conditions and restrictions provided in this section are met. Patterned pavement treatments are covered under *Section 523* of the *FDOT Specifications* and are surface markings applied either as an overlay to the pavement surface or imprinted in the pavement surface. Architectural pavers are covered under *Section 526* of the *FDOT Specifications* and consist of brick pavers or concrete pavers placed on specially prepared bedding material.

These alternative pavement treatments are purely aesthetic treatments and are not considered to be traffic control devices. Use of either of these treatments is highly restricted as stated below. Even when all conditions and restrictions are met, any decision to use these treatments should consider that there may be potential adverse impacts to the traveling public as well as potential long term maintenance problems. Architectural pavers have been found to create significant ride-ability problems even on low speed roadways. Therefore, architectural pavers are prohibited within the traveled way on the State Highway System. Properly installed patterned pavement treatments do not significantly affect ride-ability; however, their use is also restricted since they are not likely to sustain their friction and wear characteristics for the full life of typical roadway pavement.

Note: These alternative pavement treatments are purely aesthetic treatments and are not considered to be traffic control devices.

These paving treatments involve additional construction and maintenance costs not associated with typical roadway pavement. Therefore, appropriate agreements with the local maintaining agency must be obtained. The local maintaining agency must provide the additional funding for construction and assume responsibility for regular inspection and maintenance of the pavement treatment. In cases where existing alternative pavement is being removed as part of a Department project, replacement of such pavement must adhere to the requirements in this section regardless of the circumstances of the original installation and maintenance. Maintenance agreements for installations within the traveled way on the State Highway System must include the provisions outlined in *Section 2.1.6.2* for the duration of the installation.



Patterned Pavement:

1. Use on the traveled way of the State Highway System is restricted to areas within marked pedestrian crosswalks where the design speed is 45 mph or less; however, patterned pavement may be used on crosswalks across limited access roads with heavy truck traffic turning movements.
2. The pavement treatment must be the same pavement type as, and conform to, the existing pavement. For example, replacing flexible pavement with rigid pavement at the ends of a crosswalk where the abutting pavement is rigid will likely result in pavement joint problems and adverse impacts to rideability. This type treatment is therefore not permitted. Replacing flexible pavement with rigid pavement for an entire intersection including crosswalks may be permitted with a Technical Special Provision submitted to the State Roadway Design Engineer for approval.
3. The initial treatment cannot be applied to any State Highway whose asphalt pavement surface is older than 5 years.
4. May be used in areas not subject to vehicle traffic such as median islands, curb extensions, sidewalks, and landscaping borders.
5. ADA requirements shall be met in areas subject to pedestrian traffic. See *PROWAG R301.5 and R301.7* and *ADAAG 302 and 303* for surface requirements.

Restrictions for Use

Examples of Normal Wear and Tear

(How these products will look over time with use)





Wear from traffic and sand from beach



Wear from traffic



Wear from traffic and dirt and other material deposition

“Mill and Fill: failure



01/15/2009

“Mill and Fill” failure





Wear from traffic



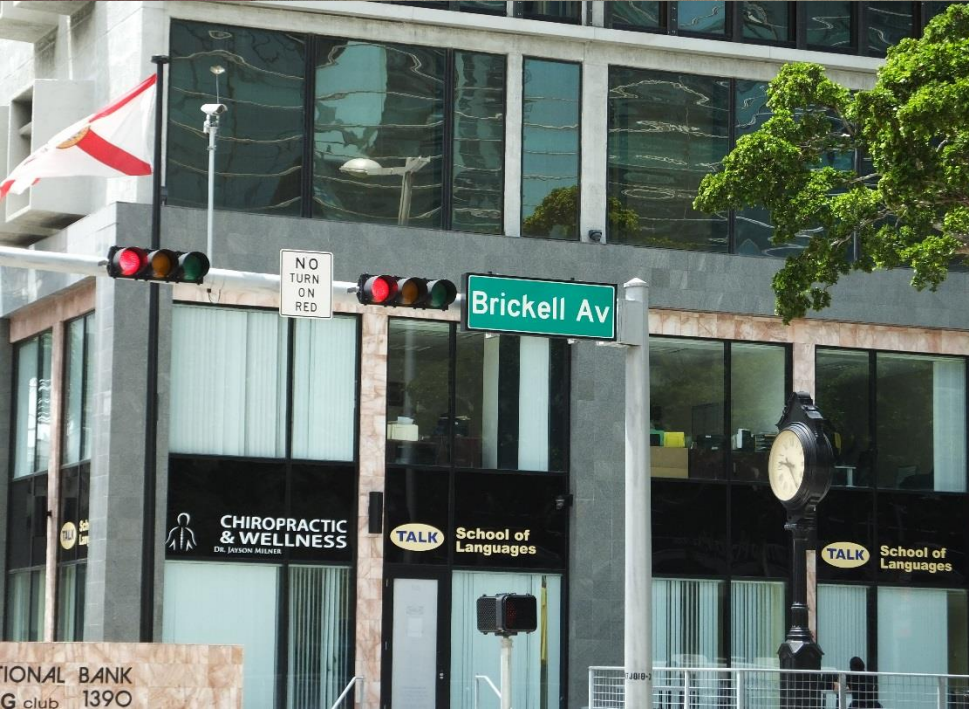
Wear from traffic



FrictionPave (after repair modifications were made)



FrictionPave (after repair modifications were made)





Examples of Product Failures Due to Improper Use

Or: Location, Location, Location



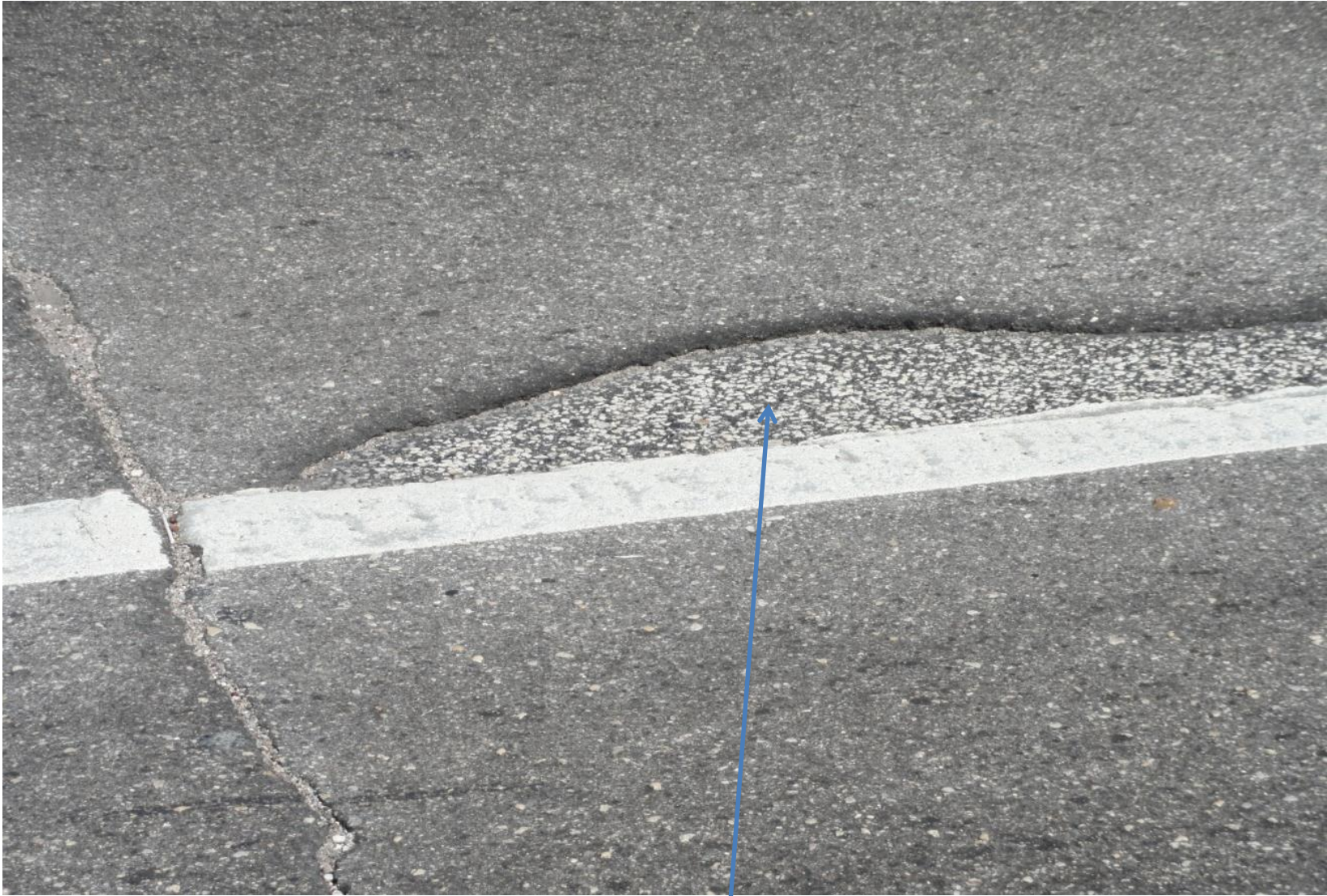
Heavy Truck Traffic Damage



Delamination of asphalt leading up to the crosswalk bar.



Damage due to poor asphalt condition



Friction surface delamination



Note the difference in depth between curb and gutter and road surface

When patterned pavement treatments are used, the plans shall identify the location, patterned type (brick, stone, etc.), and surface color. Because local agencies must fund and maintain these treatments, product brands, colors and patterns may be specified in the plans as long as the brand is listed on the QPL at the time of use.

Design Variations to any of the requirements in this Section shall be approved by the

Because Local Agencies MUST FUND and MAINTAIN these treatments,
product brands, colors and patterns
may be specified in the plans as
long as the brand is listed on the
APL at the time of use.

Note: If a specific product is identified on the plans when Federal Funding is being used – the Proprietary Products process must be followed.

P.P.M. Section 2.1.6.1 also states:

Local Agency MUST

- Provide Funding and**
- Sign a Maintenance Agreement**

within the traveled way on the State Highway System shall include the provisions outlined in Section 2.1.6.2 for the duration of the installation.

maintenance costs not
agreements with the
agency shall provide
regular inspection
its for installations

FDOT Roadway Design Plans Preparation Manual (1-16)

Section 2.1.6.2 states:

2.1.6.2 Maintenance Memorandum of Agreement Requirements for Patterned Pavement

Prior to the installation of patterned pavement crosswalks in intersections on the State Highway System, a Maintenance Memorandum of Agreement must be entered into with the local government agency requesting this aesthetic enhancement to the project. This agreement must be filed with the District Maintenance Office. This Agreement requires the local government agency to acknowledge that the installation and maintenance of patterned pavement is the total responsibility of the local agency, including contracting for friction testing with a qualified firm.

"Maintenance" of all patterned pavement crosswalks in these Agreements must be defined, as a minimum, to include its frictional characteristics and integrity as follows:

1. Evaluate all lanes of each patterned crosswalk for surface friction within 60 days of project acceptance by the Department. Conduct the friction test using either a locked wheel tester in accordance with *FM 5-592 (Florida Test Method for Friction Measuring Protocol for Patterned Pavements)* or a Dynamic Friction Tester in accordance with *ASTM E1911*. *FM 5-592* can be accessed at the following link:

<http://materials.dot.state.fl.us/smo/administration/resources/library/publications/fs/tm/Methods/fm5-592.pdf>

The initial friction resistance must be at least 35 obtained at 40 mph with a ribbed tire test (FN40R) or equivalent. Failure to achieve this minimum resistance will require all deficient crosswalk areas to be removed to their full extent (lane-by-lane) and replaced with the same product installed initially. If the Department determines that more than 50% of the lanes in the intersection require replacement, the entire intersection installation may be reconstructed with a different product on the Approved Products List (APL) or replaced with conventional pavement.

2. Approximately one year after project acceptance and every two years thereafter and for the life of the adjacent pavement, only the outside traffic lane areas of each patterned crosswalk must be tested for friction resistance in accordance

with *ASTM E274* or *ASTM E1911*. Friction resistance must, at a minimum, have a FN40R value of 35 (or equivalent).

3. Send the results of all friction tests to the District's Warranty Coordinator with a cover letter either certifying that the crosswalks comply with the minimum friction criteria, or stating what remedial action will be taken to restore the friction.
4. Failure to achieve the minimum resistance requires all lanes of the crosswalk to be friction tested to determine the extent of the deficiency. All deficient areas must be removed to their full extent (lane-by-lane) and replaced with the same product installed initially. If the Department determines that more than 50% of the lanes in the intersection require replacement, the entire intersection installation may be reconstructed with a different product on the APL or replaced with conventional pavement.
5. When remedial action is required in accordance with the above requirements, the local agency must complete all necessary repairs at its own expense within 90 days of the date when the deficiency was identified. No more than two full depth patterned pavement repairs can be made to an area without first resurfacing the underlying pavement to 1" minimum depth.
6. The Department will not be responsible for replacing the treatment following any construction activities in the vicinity of the treatment.
7. Should the local agency fail to satisfactorily perform any required remedial work in accordance with this agreement, the Department reserves the right to replace the patterned pavement with conventional pavement (matching the adjacent pavement) and bill the local agency for this cost.

FM 5-592 Florida Test Method for Friction Measuring Protocol for Patterned Pavements

Note: can be found on State Materials Office website under “Documents and Publications”

March 1, 2011

Revised: December 6, 2011

Florida Test Method for Friction Measuring Protocol for Patterned Pavements

Designation: FM 5-592

1. SCOPE

This method covers the testing procedures for evaluating the friction resistance of Patterned surfaces used in crosswalks over asphalt and concrete surfaces

Note: This test method contains two parts:

Part A- Friction testing performed with the Locked Wheel Friction Tester

Part B- Friction testing performed with the Dynamic Friction Tester (DFT)

2. APPARATUS

2.1 Locked Wheel Friction Tester- This apparatus shall be standardized in

Frequency of Friction Testing for Patterned Pavement

MMOA (Maintenance Memorandum of Agreement:

- **Local Agency is responsible for the skid testing and the cost:**
 - **Within 60 days of project acceptance by the department,**
 - **Approx. 1 year after project acceptance, and**
 - **Every 2 years thereafter and for the life of the adjacent pavement.**
- **Reports are sent to the District Warranty Coordinator.**

2. Approximately one year after project acceptance and every two years thereafter and for the life of the adjacent pavement, only the outside traffic lane areas of each patterned crosswalk shall be tested for friction resistance in accordance with *ASTM E274* or *ASTM E1911*. Friction resistance shall, at a minimum, have a FN40R value of 35 (or equivalent).

3. District Warranty Coordinator is responsible for monitoring the friction testing

4. Failure to achieve the minimum resistance shall require all lanes of the crosswalk to be friction tested to determine the extent of the deficiency. All deficient areas shall be removed to their full extent (lane-by-lane) and replaced with the same product installed initially. If the Department determines that more than 50% of the lanes in the intersection require replacement, the entire intersection installation may be reconstructed with a different product on the QPL or replaced with conventional pavement.

5. The Local Agency has 90 days to repair deficiencies. Local Agency is responsible for expenses.

6. construction activities in the vicinity of the treatment.

7. Should the local agency fail to satisfactorily perform any required remedial work

7. The Department can remove all patterned pavement if the Local Agency does not maintain it per this agreement.



Florida Department of Transportation

RICK SCOTT
GOVERNOR

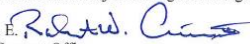
605 Suwannee Street
Tallahassee, FL 32399-0450

ANANTH PRASAD, P.E.
SECRETARY

PROJECT MANAGEMENT MEMORANDUM 13-01

DATE: May 22, 2013

TO: District Directors of Transportation Development, District Directors of Transportation Operations, District Design Engineers, District Traffic Operations Engineers, and District Consultant Project Management Engineers

FROM: Robert W. Crim, II, P. E. 
Manager, Production Support Office

COPIES: Tom Byron, Duane Brautigam, Michael Shepard, Mark Wilson

SUBJECT: Pedestrian Crosswalks and Requirements when Using Patterned Pavement

This memorandum serves to advise District Production Staff and Consultant Project Managers of recent project reviews which revealed new maintenance agreements were still using outdated requirements for patterned pavements. This memorandum also serves to clarify the existing requirements for marking pedestrian crosswalks.

BACKGROUND

The use of patterned pavements and the associated requirements is covered in the *Plans Preparation Manual, Vol. 1, Chapter 2.1.6.1*. These paving treatments involve additional construction and maintenance costs not associated with typical roadway pavement. Therefore, appropriate agreements with the local maintaining agency shall be obtained.

Maintenance agreements for patterned pavement within the traveled way on the State Highway System shall include the provisions outlined in *PPM Section 2.1.6.2* for the duration of the installation. Previous maintenance agreement language outlining outdated friction resistance requirements and testing frequency shall not be used. The initial friction resistance requirements, the allowable testing methods and the testing frequency described in the *PPM* must be included in a maintenance agreement with any local agency requesting patterned pavements.

Furthermore, these alternative pavement treatments are considered as purely aesthetic treatments and not as traffic control devices. This is covered in Chapter 3G of the *2009 Manual on*

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May 22, 2013

Uniform Traffic Control Devices. Patterned pavements within crosswalks are not considered to be a mitigation strategy to address pedestrian safety issues. Patterned pavements within crosswalks are not a substitute for special emphasis crosswalk markings.

The guidance for the location and installation, signing, and marking of midblock and heavy pedestrian concentration area crosswalks are provided in the *FDOT Traffic Engineering Manual*. For all midblock crosswalks, special emphasis crosswalk markings shall be used, as shown in the *Department's Design Standards, Index No. 17346*. Special emphasis crosswalk markings may also be used for added visibility at signalized intersection approaches where there is a documented need for this treatment. Special emphasis crosswalk markings should not be applied indiscriminately at intersection approaches without a documented need.

IMPLEMENTATION

There are no changes to the current guidance provided in the *Plans Preparation Manual*, the *Design Standards* or the *FDOT Traffic Engineering Manual*. The Districts are expected to insure the current requirements are being addressed through existing or updated Quality Assurance processes. A training webinar on pedestrian crosswalks, markings, and the use of patterned pavements will be developed and presented through the Engineering Academy, a weekly webinar hosted by the Office of Design.

Office of Design staff is available to answer questions or provide any direction on the use of patterned pavements, and clarify any requirements to be included in a maintenance agreement with the responsible local agency.

CONTACTS

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Pedestrian Crosswalks and Requirements when Using Patterned Pavement

Project Management Memorandum 13-01 dated 5-22-2013

Summary

- Two Categories:
 - Vehicular and Non-vehicular
- Restrictions for Use:
 - Design speed 45 MPH or less, and
 - Pavement must be in good condition and 5 years old or less
- Specific product named in the plans is allowed when the Local Agency is paying,
 - Otherwise, Federal Funding requires compliance with the Proprietary Products process.

Summary cont.

- MMOA is Mandatory
 - Pavement Must be Skid tested regularly,
 - Local Agency responsible for all testing and all costs,
 - District Warranty Coordinator responsible for reviewing test data performance and enforcement,
 - Local Agency responsible for all maintenance and costs,
 - District may remove any and all product if Local Agency does not maintain passing skid values.



Lehman Causeway - Miami

Pineada Causeway - Melbourne





Florida Department of Transportation

RICK SCOTT
GOVERNOR

605 Sumner Street
Tallahassee, FL 32399-0450

JIM BOXOLD
SECRETARY

MEMORANDUM

DATE: July 10, 2015

TO: Dewayne Carver, State Bicycle/Pedestrian Coordinator

FROM: Charles Holzschuher, State Pavement Performance Engineer

COPIES: Bouzid Choubane, State Pavement Material Systems Engineer
Edward Offei, Pavement Performance Consultant
Guangning Wang, Pavement Performance Evaluation Engineer

SUBJECT: Dynamic Friction Tester (DFT) and Circular Texturemeter (CTM) Testing on
Green Colored Pavement Bike Lanes

1. Introduction



A special request was made to evaluate the friction and texture characteristics on five selected green bike lane treatment materials. Two tests were performed, namely Dynamic Friction Tester (DFT) in accordance with ASTM E 1911 and Circular Track Meter (CTM) test in accordance with ASTM E 2157.

Five test locations in two different counties were selected for the test. They are Lehman Causeway, Julia Tuttle Causeway, MacArthur Causeway, and Rickenbacker Causeway, all in Miami-Dade County and Pineda Causeway in Brevard County. A typical test plan for the green bike lane section is shown in Figure 1. As shown, the test section for each bike lane was divided into two sections, namely a control section representing the bike lane with limited/no traffic interaction and a keyhole section that represent a traffic conflict area (conflict between vehicular traffic and cyclists). Three tests were conducted on the control section, and 6 at the keyhole section. The keyhole test section has 3 tests performed on the green colored strips (keyhole on-strips) and the other 3 on the existing roadway surface between strips (keyhole off-strips). Both DFT and CTM tests were performed at each test spot. For the DFT test, friction values in terms of DFT at 20mph (30km/h), 30mph (50km/h) and 40 mph (60km/h) were recorded. For the CTM test, the Mean Profile Depth (MPD) measurements were recorded. The existing pavement surface type, type of bike lane treatment and number of tests per equipment are summarized in Table 1. The testing results for each testing locations are summarized in the following section.

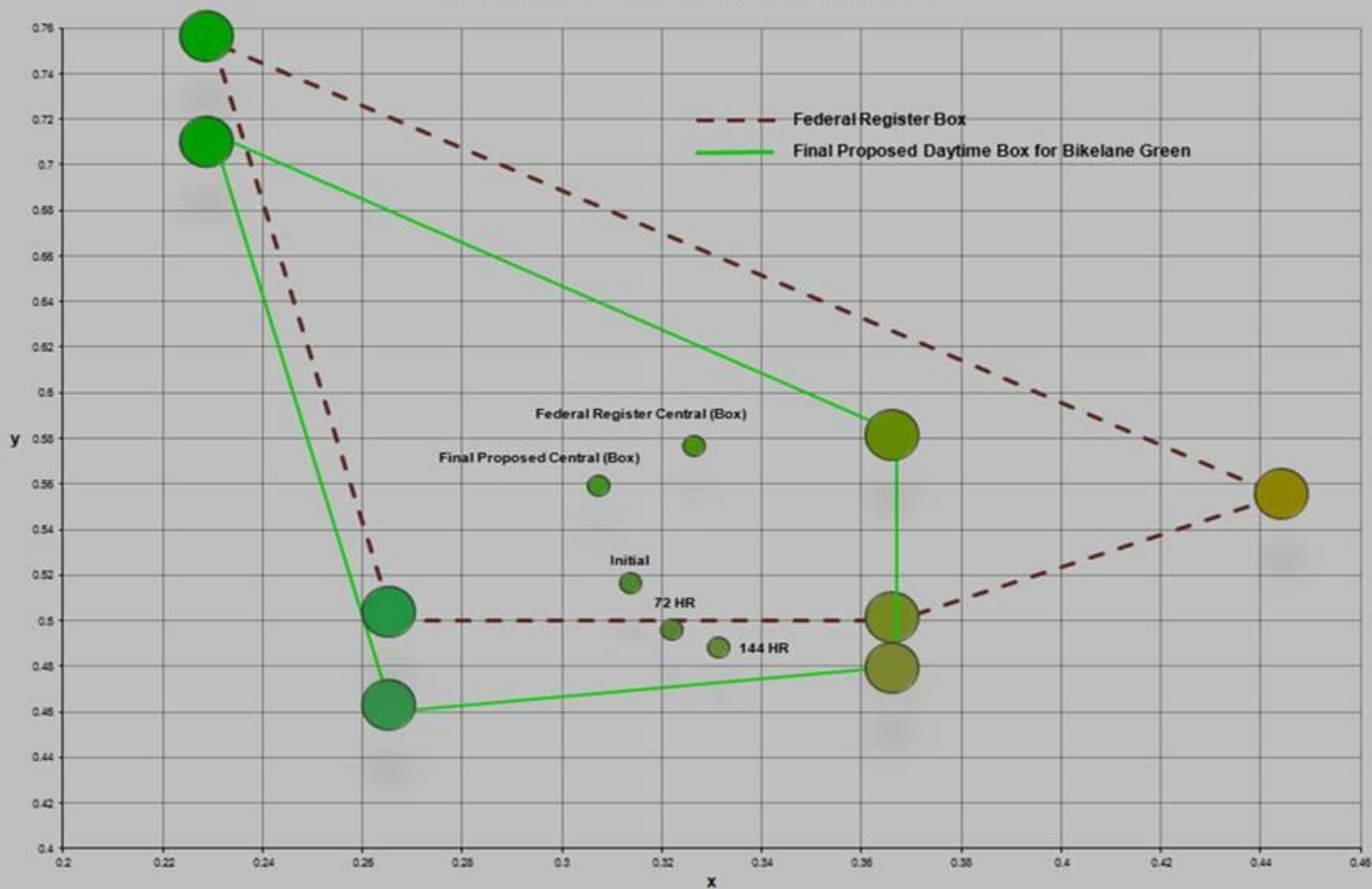
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Green Bike Lane Friction testing 7-2015

Table 4. DFT Measurements on MacArthur Causeway

Test Sites	Run#	DFT			CTM	Field Texture Picture
		Testing Speed mph (km/h)			MPD	
		20 (30)	30 (50)	40 (65)	(in.)	
MacArthur Causeway On Ramp						
Bike Lane (Control)	1	0.673	0.706	0.735	0.014	
	2	0.719	0.756	0.788	0.009	
	3	0.611	0.647	0.685	0.008	
	AVG	0.668	0.703	0.736	0.010	
Bike Lane (Keyhole-On Strip)	RWP	0.554	0.563	0.590	0.008	
	Center	0.513	0.522	0.533	0.009	
	LWP	0.520	0.510	0.539	0.008	
	AVG	0.529	0.532	0.554	0.009	
Bike Lane (Keyhole-Off Strip)	RWP	0.469	0.514	0.559	0.010	
	Center	0.410	0.464	0.512	0.010	
	LWP	0.404	0.442	0.477	0.012	
	AVG	0.428	0.473	0.516	0.011	
MacArthur Causeway Off Ramp						
Bike Lane (Control)	1	0.476	0.448	0.435	0.009	
	2	0.476	0.460	0.454	0.008	
	3	0.461	0.440	0.430	0.013	
	AVG	0.471	0.449	0.440	0.010	
Bike Lane (Keyhole-On Strip)	RWP	0.521	0.495	0.492	0.008	
	Center	0.510	0.497	0.495	0.008	
	LWP	0.478	0.470	0.463	0.010	
	AVG	0.503	0.487	0.483	0.009	
Bike Lane (Keyhole-Off Strip)	RWP	0.460	0.440	0.430	0.013	
	Center	0.463	0.443	0.439	0.011	
	LWP	0.444	0.444	0.443	0.012	
	AVG	0.456	0.442	0.437	0.012	

ASTM G154 Cycle 1
(D65/2 - Average Values at Indicated Exposure Intervals)



Federal Register Box

**Final Proposed Box
for Bike Lane Green**

**Standard Practice Specification for
Durable Green Bike Lane Surface Treatments for
Asphalt and Concrete Pavements**

AASHTO Designation: PP XX-16

Contact Information

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Paul Gentry	Product Evaluator Coordinator	Paul.gentry@dot.state.fl.us	(850) 414-4118
Andy Harper	Product Evaluator	Clifton.harper@dot.state.fl.us	(850) 414-4776

Installing, Testing, Acceptance of Traffic Marking Materials



Field Testing, Acceptance and Evaluation of Signs and Sheeting Materials



The words "THANK YOU" are rendered in a bold, three-dimensional, light blue font. The letters have a slight shadow and a beveled edge, giving them a 3D appearance. They are set against a solid black rectangular background that is slightly tilted.

Questions?